

WHAT IS CLAIMED IS:

1. A method of fabricating a semiconductor device comprising:
forming at least one layer on a first and a second side of a semiconductor substrate;

5 removing portions of the at least one layer on the first side of the semiconductor substrate to form a pattern of the at least one layer on the first side of the substrate while maintaining the at least one layer on the second side of the substrate;

forming a capping layer on the pattern of the at least one layer on the first side of the substrate and on the at least one layer on the second side of the semiconductor substrate;

removing the capping layer on the second side of the semiconductor substrate thereby exposing the at least one layer on the second side of the substrate while maintaining the capping layer on the first side of the substrate;

15 removing the at least one layer on the second side of the semiconductor substrate, while maintaining the capping layer and the pattern of the at least one layer on the first side of the semiconductor substrate; and

removing a portion of the capping layer on the first side of the semiconductor substrate.

20
2. The method of Claim 1 wherein removing the capping layer on the second side of the semiconductor substrate further comprises applying an etching solution to the second side of the semiconductor substrate while applying a protective material to the first side of the semiconductor substrate to protect the first side from the etching solution.

3. The method of Claim 2, wherein removing the capping layer on the second side of the semiconductor substrate further comprises rotating the semiconductor substrate about an axis substantially perpendicular to a major surface of the semiconductor substrate while applying the etching solution.

4. The method of Claim 2, wherein the protective material comprises a fluid.

5. The method of Claim 2, wherein the protective material comprises deionized water.

6. The method of Claim 2, wherein the protective material comprises an inert gas.

7. The method of Claim 1, further comprising etching the capping layer to form a contact pad.

8. The method of Claim 1, wherein removing a portion of the at least one layer on the first side comprises selectively etching a portion of the at least one layer to form a semiconductor structure on the first side of the semiconductor substrate.

9. The method of Claim 1, wherein removing the capping layer on the second side of the semiconductor substrate comprises removing the capping layer

on substantially the entire second side of the semiconductor substrate.

10. The method of Claim 1, wherein removing the at least one layer on the second side of the semiconductor substrate comprises removing the at least one layer on substantially the entire second side of the semiconductor substrate.

11. The method of Claim 1, wherein removing the at least one layer on the second side of the semiconductor substrate precedes removing a portion of the capping layer on the first side of the semiconductor substrate.

12. The method of Claim 11, wherein removing portions of the at least one layer on the first side of the semiconductor substrate to form a pattern of the at least one layer precedes forming a capping layer on the pattern of the at least one layer.

13. A method of fabricating a semiconductor device comprising:
forming one or more layers on a first side and a second side of a semiconductor substrate;
rotating the semiconductor substrate about an axis substantially perpendicular to a major surface of the semiconductor substrate; and
applying an etching solution while the semiconductor substrate is rotating to remove a portion of the one or more layers on the second side of the semiconductor substrate while maintaining the one or more layers on the first side of the semiconductor substrate.

14. The method of Claim 13, further comprising applying a protective material to the first side of the semiconductor substrate.

15. A method for forming a memory device comprising:

5 forming a gate insulating layer on a first side and a second side of a semiconductor substrate;

forming a gate electrode layer on the gate insulating layer on the first and the second sides of the semiconductor substrate;

10 forming a masking layer on the gate electrode layer on the first and the second sides of the semiconductor substrate;

15 patterning the gate insulating layer, the gate electrode layer and the masking layer on the first side of the semiconductor substrate to form a gate pattern on the first side of the semiconductor substrate while maintaining the gate insulating layer, the gate electrode layer, and the masking layer on the second side of the semiconductor substrate;

forming a conductive layer on the gate pattern and on the first side of the substrate and on the masking layer on the second side of the semiconductor substrate;

20 removing the conductive layer on the second side of the semiconductor substrate thereby exposing the masking layer;

removing the masking layer, the gate electrode layer and the gate insulating layer on the second side of the semiconductor substrate while maintaining the conductive layer and the gate pattern on the first side of the semiconductor substrate; and

25 removing a portion of the conductive layer on the first side of the

semiconductor substrate to form contact pads between portions of the gate pattern.

16. A method for fabricating a semiconductor device comprising:

providing a semiconductor substrate including a front side and a back side;

5 stacking at least one material layer on the front side and the back side of the semiconductor substrate;

selectively etching the material layer on the front side of the semiconductor substrate to form a first structure;

forming a capping layer covering the material layer of the back side of the semiconductor substrate and on the first structure on the front side of the semiconductor substrate;

rotating the semiconductor substrate;

supplying an etching solution on the back side of the semiconductor substrate while the semiconductor substrate is rotating to selectively remove the capping layer on the back side while maintaining the capping layer on the front side;

15 protecting the first structure through the capping layer in synchrony with removing the material layer of the back side of the semiconductor substrate; and

patterning the capping layer to form a second structure on the front side of the substrate.

17. The method for fabricating the semiconductor device of Claim 16,

wherein the step of removing the capping layer of the back side of the semiconductor substrate comprises: rotating the semiconductor substrate and

25 jetting the etching solution to the back side of the semiconductor substrate,

wherein the front side of semiconductor substrate is protected from the etching solution by jetting a protective material.

18. The method for fabricating the semiconductor device of Claim 16,
5 wherein protecting the first structure on the front side of the semiconductor substrate comprises jetting a deionized water.

19. The method for fabricating the semiconductor device of Claim 16,
wherein protecting the first structure on the front side of the semiconductor
10 substrate comprises jetting inert gases.

20. The method for fabricating the semiconductor device of Claim 16,
wherein the step of jetting the etching solution comprises:

jetting the protective material on the front side of semiconductor substrate
15 while the semiconductor substrate is rotating;
providing the etching solution to the back side of the semiconductor
substrate while the protective material is jetted;
stopping providing the etching solution; and
stopping jetting the protective material.

20 21. The method for fabricating the semiconductor device of Claim 16, wherein supplying an etching solution on the back side of the semiconductor substrate includes providing an etchant having high etch selectivity with respect to the material layer while maintaining the capping layer.

22. The method for fabricating the semiconductor device of Claim 16, wherein supplying an etching solution on the back side of the semiconductor substrate includes:

providing an bath containing the etching solution having high etching with
5 respect to the material layer while maintaining the capping layer;
bathing the semiconductor substrate in the bath; and
cleaning the semiconductor substrate.